

CLAIMS

- [c1] 1. A method for selecting a stimulation site in a language-disorder patient, comprising:
- directing a patient to perform a language-based task;
- directing information to be collected, the information corresponding to a level of neural activity in the patient's brain while the patient performs the language-based task; and
- based at least in part on the information, selecting a stimulation site within the patient's skull for receiving an electrode coupleable to an electrical current.
- [c2] 2. The method of claim 1 wherein selecting a stimulation site includes selecting a stimulation site located within the patient's brain.
- [c3] 3. The method of claim 1 wherein selecting a stimulation site includes selecting a stimulation site at least proximate to a cortex of the patient's brain.
- [c4] 4. The method of claim 1 wherein selecting a stimulation site includes selecting a stimulation site at least proximate to at least one of Broca's area, Wernicke's area, and neuronal connections extending between Broca's area and Wernicke's area.
- [c5] 5. The method of claim 1 wherein selecting a stimulation site includes selecting a stimulation site at least proximate to at least one of the middle temporal gyrus, the retrosplenial cortex and the retrosplenial cuneus of the brain.
- [c6] 6. The method of claim 1 wherein directing the patient to perform a language-based task includes directing the patient to perform a task that requires no verbal output.

- [c7] 7. The method of claim 1 wherein directing the patient to perform a language-based task includes directing the patient to silently generate a verb associated with a common noun.
- [c8] 8. The method of claim 1 wherein directing the patient to perform a language-based task includes directing the patient to repeat a noun.
- [c9] 9. The method of claim 1 wherein directing the patient to perform a language-based task includes directing the patient to retrieve a word based on a letter cue.
- [c10] 10. The method of claim 1 wherein directing the patient to perform a language-based task includes directing the patient to retrieve a word based on a visual cue.
- [c11] 11. The method of claim 1 wherein directing the patient to perform a language-based task includes directing the patient to respond nonverbally to an oral task that requires the patient to understand the difference between two auditory commands.
- [c12] 12. The method of claim 1, further comprising implanting an electrode at least proximate to the stimulation site.
- [c13] 13. The method of claim 1, further comprising:
 administering a neuroexcitatory drug to the patient; and
 directing the information to be collected while the patient performs the
 language-based task with the neuroexcitatory drug active in the
 patient's body.
- [c14] 14. The method of claim 1 wherein directing information to be collected includes directing a computer-based routine to collect the information.

[c15] 15. The method of claim 1, further comprising directing the formation of an image of at least a portion of the patient's brain, with at least a portion of the image having features representative of the information.

[c16] 16. The method of claim 1 wherein directing information to be collected includes directing the formation an image of at least a portion of the patient's brain, the image including a first region with a characteristic of the first region having a first value, the image further including a second region with a characteristic of the second region having a second value different than the first value.

[c17] 17. The method of claim 1 wherein directing a patient to perform a language-based task includes directing the patient to perform a first language-based task and wherein directing information to be collected includes directing first information to be collected while the patient performs the first language-based task, and wherein the method further comprises:

- directing the patient to perform a second language-based task;
- directing second information to be collected while the patient performs the second language-based task; and
- determining a location for the stimulation site based on both the first information and the second information.

[c18] 18. The method of claim 1 wherein directing a patient to perform a language-based task includes directing the patient to perform a first language-based task subject to a language disorder and wherein directing information to be collected includes directing first information to be collected while the patient performs the first language-based task, and wherein the method further comprises:

- monitoring a first image of the patient's brain function while the patient performs the first language-based task;
- identifying a second language-based task subject to a language disorder;

monitoring a second image of the patient's brain function while the patient performs the second language-based task; and
comparing the first and second images to identify at least one stimulation site of the brain.

[c19] 19. A method for treating a language disorder of a patient, comprising:
selecting a stimulation site of a patient's brain, the stimulation site being located within the patient's skull;
positioning at least one electrode at the stimulation site;
coupling the at least one electrode to a source of electrical potential; and
at least reducing a language disorder of the patient by applying electrical stimulation directly to the stimulation site via the at least one electrode.

[c20] 20. The method of claim 19 wherein positioning at least one electrode includes implanting the at least one electrode.

[c21] 21. The method of claim 19, further comprising:
directing the patient to perform a language-based task;
directing information to be collected, the information corresponding to a level of neural activity in the patient's brain while the patient performs the language-based task; and
selecting the stimulation site based at least in part on the information.

[c22] 22. The method of claim 19 wherein applying an electrical stimulation includes applying an electrical stimulation to the left hemisphere of the brain.

[c23] 23. The method of claim 19 wherein applying an electrical stimulation includes applying an electrical stimulation to the right hemisphere of the brain.

- [c24] 24. The method of claim 19 wherein applying an electrical stimulation includes applying an electrical stimulation to the right hemisphere of the brain to disrupt compensatory participation of the right hemisphere in recovery of damage to the left hemisphere.
- [c25] 25. The method of claim 19 wherein at least reducing a language disorder of the patient includes at least reducing an aphasia of the patient.
- [c26] 26. The method of claim 19 wherein applying an electrical stimulation includes applying an electrical stimulation at least proximate to at least one of Broca's area, Wernicke's area, and neuronal connections extending between Broca's area and Wernicke's area.
- [c27] 27. The method of claim 19 wherein applying an electrical stimulation includes applying an electrical stimulation to at least one of the middle temporal gyrus, the retrosplenial cortex and the retrosplenial cuneus of the brain.
- [c28] 28. The method of claim 19, further comprising engaging the patient in a language-based comprehension task while applying the electrical stimulation.
- [c29] 29. The method of claim 19, further comprising applying the electrical stimulation while not actively engaging the patient in a language-based task.
- [c30] 30. The method of claim 19, further comprising engaging the patient in a speech therapy task while applying the electrical stimulation.
- [c31] 31. The method of claim 19, further comprising not engaging the patient in a speech therapy task while applying the electrical stimulation.
- [c32] 32. The method of claim 19, further comprising:
 administering a neuroexcitatory drug to the patient; and

applying the electrical stimulation while the neuroexcitatory drug is active in the patient's body.

[c33] 33. The method of claim 19 wherein applying electrical stimulation includes applying electrical stimulation below a level that causes movement, speech or sensation in the patient.

[c34] 34. The method of claim 19 wherein applying electrical stimulation includes applying electrical stimulation at or above a level that causes movement, speech or sensation in the patient.

[c35] 35. The method of claim 19 wherein at least reducing a language disorder includes eliminating the language disorder.

[c36] 36. The method of claim 19, further comprising locating the stimulation site relative to an anatomical feature of the patient.

[c37] 37. The method of claim 19, further comprising locating the stimulation site relative to a fiducial having a fixed location relative to the patient's skull.

[c38] 38. The method of claim 19 wherein applying an electrical stimulation includes applying a varying electrical stimulation signal having a frequency of from about 5 Hz to about 200 Hz.

[c39] 39. The method of claim 19 wherein applying an electrical stimulation includes applying a varying electrical stimulation signal having an electrical potential of from about 0.25 volts to about 5.0 volts.

[c40] 40. A method for treating a language disorder, comprising:
directing a patient to perform a language-based task;

directing information to be collected, the information corresponding to a level of neural activity in the patient's brain while the patient performs the language-based task; and
at least reducing a language disorder of the patient by applying an electrical stimulation at least proximate to a stimulation site, the location of the stimulation site being based at least in part on the information.

[c41] 41. The method of claim 40 wherein directing the patient to perform a language-based task includes directing the patient to perform a task that requires no verbal output.

[c42] 42. The method of claim 40 wherein directing the patient to perform a language-based task includes directing the patient to silently generate a verb associated with a common noun.

[c43] 43. The method of claim 40 wherein directing the patient to perform a language-based task includes directing the patient to repeat a noun.

[c44] 44. The method of claim 40 wherein directing the patient to perform a language-based task includes directing the patient to retrieve a word based on a letter cue.

[c45] 45. The method of claim 40 wherein directing the patient to perform a language-based task includes directing the patient to retrieve a word based on a visual cue.

[c46] 46. The method of claim 40 wherein directing the patient to perform a language-based task includes directing the patient to respond nonverbally to an oral task that requires the patient to understand the difference between two auditory commands.

- [c47] 47. The method of claim 40, further comprising:
administering a neuroexcitatory drug to the patient; and
applying the electrical stimulation while the neuroexcitatory drug is active in
the patient's body.
- [c48] 48. The method of claim 40, further comprising:
administering a neuroexcitatory drug to the patient; and
directing the information to be collected while the patient performs the
language-based task with the neuroexcitatory drug active in the
patient's body.
- [c49] 49. The method of claim 40 wherein directing information to be collected
includes directing a computer-based routine to collect the information.
- [c50] 50. The method of claim 40, further comprising directing the formation of
an image of at least a portion of the patient's brain, with at least a portion of the
image having features representative of the information.
- [c51] 51. The method of claim 40 wherein directing information to be collected
includes directing the formation an image of at least a portion of the patient's brain,
the image including a first region with a characteristic of the first region having a
first value, the image further including a second region with a characteristic of the
second region having a second value different than the first value.
- [c52] 52. The method of claim 40 wherein directing information to be collected
includes directing information to be collected corresponding to blood oxygen levels
in the brain.
- [c53] 53. The method of claim 40, further comprising implanting at least one
electrode at least proximate to the stimulation site, and wherein applying an

electrical stimulation includes applying an electrical signal to the at least one electrode.

[c54] 54. The method of claim 40, further comprising placing an electrode at least proximate to the stimulation site.

[c55] 55. The method of claim 40 wherein directing a patient to perform a language-based task includes directing the patient to perform a first language-based task and wherein directing information to be collected includes directing first information to be collected while the patient performs the first language-based task, and wherein the method further comprises:

- directing the patient to perform a second language-based task;
- directing second information to be collected while the patient performs the second language-based task; and
- determining a location for the stimulation site based on both the first information and the second information.

[c56] 56. A method for treating language disorders, comprising:

- identifying first and second language tasks subject to a language disorder;
- monitoring a first image of the patient's brain function while the patient performs the first language-based task;
- monitoring a second image of the patient's brain function while the patient performs the second language-based task;
- comparing the first and second images to identify at least one stimulation site of the brain;
- placing at least one electrode at least proximate to the at least one stimulation site; and
- at least reducing the patient's language disorder by applying an electrical stimulation at least proximate to the at least one stimulation site.

- [c57] 57. The method of claim 56 wherein identifying first and second language-based tasks includes identifying tasks that require no verbal output.
- [c58] 58. The method of claim 56, further comprising:
administering a neuroexcitatory drug to the patient; and
applying the electrical stimulation while the neuroexcitatory drug is active in the patient's body.
- [c59] 59. The method of claim 56 wherein monitoring a first image includes monitoring a first image depicting values corresponding to blood oxygen levels in the brain.
- [c60] 60. The method of claim 56, further comprising implanting at least one electrode at least proximate to the stimulation site, and wherein applying an electrical stimulation includes applying an electrical signal to the at least one electrode.
- [c61] 61. A method for treating a brain disorder, comprising:
directing a patient to perform a task;
directing information to be collected, the information corresponding to a level of neural activity in the patient's brain while the patient performs the task; and
applying an electrical stimulation at least proximate to a stimulation site of the patient's brain while directing the information to be collected.
- [c62] 62. The method of claim 61 wherein applying an electrical stimulation includes at least reducing a severity of a brain disorder of the patient.
- [c63] 63. The method of claim 61 wherein directing information to be collected includes directing the collection of functional magnetic resonance image data.

- [c64] 64. The method of claim 61 wherein directing a patient to perform a task includes directing the patient to perform a language-based task.
- [c65] 65. The method of example 61, further comprising implanting an electrode at least proximate to the stimulation site, wherein applying an electrical stimulation includes applying an electrical stimulation via the electrode.
- [c66] 66. The method of claim 61 wherein directing the patient to perform a task includes directing the patient to perform a language-based task that requires no verbal output.
- [c67] 67. The method of claim 61 wherein directing the patient to perform a task includes directing the patient to silently generate a verb associated with a common noun.
- [c68] 68. The method of claim 61 wherein directing the patient to perform a task includes directing the patient to repeat a noun.
- [c69] 69. The method of claim 61 wherein directing the patient to perform a task includes directing the patient to retrieve a word based on a letter cue.
- [c70] 70. The method of claim 61 wherein directing the patient to perform a task includes directing the patient to retrieve a word based on a visual cue.
- [c71] 71. The method of claim 61 wherein directing the patient to perform a task includes directing the patient to respond nonverbally to an oral task that requires the patient to understand the difference between two auditory commands.